Claims

What is claimed is:

1. An insulated article comprising:

a first wall bounding an interior volume;

a second wall spaced at a distance from the first wall to define an insulating space therebetween; and

a vent communicating with the insulating space to provide an exit pathway for gas molecules from the space, the vent being sealable for maintaining a vacuum within the insulating space following evacuation of gas molecules through the vent,

the distance between the first and second walls being variable in a portion of the insulating space adjacent the vent such that gas molecules within the insulating space are directed towards the vent by the variable-distance portion of the first and second walls during the evacuation of the insulating space, the directing of the gas molecules by the variable-distance portion of the first and second walls imparting to the gas molecules a greater probability of egress from the insulating space than ingress thereby providing a deeper vacuum without requiring a getter material within the insulating space.

2. The insulated article according to claim 1, wherein one of the walls includes a portion that converges toward the other wall adjacent the vent, and wherein the distance between the walls is at a minimum adjacent the location at which the vent communicates with the insulating space.

3. The insulated article according to claim 1, wherein the first and second walls are provided by first and second tubes arranged substantially concentrically to define an annular space therebetween.

4. The insulated article according to claim 3, wherein the converging wall portion of the one of the walls is located adjacent an end of the associated tube.

5. The insulated article according to claim 3, wherein the wall including the converging portion is provided by an outer one of the tubes.

6. The insulated article according to claim 1 further comprising a coating disposed on a surface of the one of the walls, the coating formed by a material having an emissivity that is less than that of the wall on which it is disposed.

7. The insulated article according to claim 3, wherein the first and second tubes are flexible, the article further comprising a layer disposed between the first and second tubes having relatively low thermal conductivity compared to the first and second tubes to limit thermal shorting caused by direct contact between the first and second tubes.

8. The insulated article according to claim 7, wherein the layer comprises a winding of yarn.

9. The insulated article according to claim 3 further comprising:

a third tube located within the first and second tubes and arranged substantially concentric thereto to define an annular inlet for a gas; and

a semi-spherical end cap secured to one of the first and second tube adjacent an end of the third tube, the end cap defining a chamber for expansion of the gas received in the chamber from the gas inlet.

10. The insulated article according to claim 1, wherein the article is a container and wherein the first wall defines a substantially rectangular storage space.

11. The insulated article according to claim 2, wherein the vent is defined by an opening in one of the walls and wherein a portion of the other of the walls opposite the vent is arranged such that a tangent line at each location within the portion of the other of the walls is directed substantially towards the vent.

12. The insulated article according to claim 11, wherein the article is a Dewar including an upper substantially cylindrical portion and a lower substantially spherical portion and wherein vent opening is formed in an outer one of the walls in the lower portion, an inner one of the walls being indented opposite the vent.

13. A method of insulating an article comprising the steps of:

providing first and second walls spaced at a distance from each other to define an insulating space therebetween, the distance between the walls being variable in a portion of the insulating space;

providing a vent in communication with the insulating space to provide an exit pathway for gas molecules from the insulating space, the vent located proximate to the variable distance portion of the insulating space such that gas molecules are guided towards the vent during evacuation of the insulating space to facilitate their egress from the insulating space, the vent being sealable for maintaining a vacuum within the insulating space;

subjecting an exterior of the first and second walls to a vacuum to evacuate the insulating space, the facilitated egress of gas molecules provided by the variable distance portion of the insulating space increasing the probability of gas molecule egress from the space rather than ingress such that a deeper vacuum is generated within the insulating space than the vacuum to which the exterior is subjected; and

sealing the vent to maintain the deeper vacuum within the space.

14. A cooling device comprising:

an outer jacket including a substantially cylindrical first portion and a substantially semi-spherical second portion;

a first tube received by the first portion of the outer jacket and located substantially concentric thereto to define an insulating space therebetween, at least one end of the first tube forming a sealable vent with an inner surface of the outer jacket for maintaining a vacuum within the insulating space following evacuation of gas molecules through the vent,

the distance between the first tube and the inner surface of the outer jacket being variable in a portion of the insulating space adjacent the vent such that gas molecules within the insulating space are directed towards the vent by the variable-distance portion during evacuation of the insulating space, thereby imparting to the gas molecules a greater probability of egress from the insulating space than ingress; and a

a second tube received by the first tube and located substantially concentric thereto to define a gas inlet therebetween.

15. The cooling device according to claim 14, wherein an annular pathway is defined between the first and second tubes adjacent the second portion of the outer jacket for passage of a gas from the gas inlet to an expansion chamber defined by the second portion of the outer jacket.

16. The cooling device according to claim 14, wherein the second tube is secured to the first tube adjacent an end of the second tube and wherein the second tube includes at least one hole for passage of a gas from the gas inlet to an expansion chamber defined by the second portion of the outer jacket.

17. The cooling device according to claim 14 further comprising a coating disposed on an inner surface of the second tube, the coating comprising a material having a relatively large thermal conductivity compared to the second tube.

18. The cooling device according to claim 17 wherein the coating material is copper.